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Track-It™ Pressure/Vacuum Loggers used to monitor Municipal Solid Waste Landfills (MSWLF)

Although the overall trend in utilizing landfills to dispose of solid waste has been on the decline over the last few decades, in favor of more environmentally friendly and renewable disposal methods, there are still thousands of municipal solid waste landfills in operation around the globe.

Many of these landfills are bioreactor landfills which greatly accelerate the breakdown of solid waste materials when compared to “Dry Tomb” landfills.

In addition to accelerating the decomposition process, bioreactor landfills also create a renewable source of energy in the form of methane gas. In small landfills the methane is typically collected and flared off to reduce overall carbon emissions. In larger landfills, the gas can be collected and used on site to provide fuel for local systems or even a gas powered generator that supplies electricity directly to the grid.

The systems used to extract and condition the methane and recirculate and treat the leachate must be carefully monitored to ensure proper operation and compliance. Monarch *Track-It™* Pressure/Vacuum Data Loggers are installed in many of these landfills to help with system monitoring and regulatory compliance.

So that we can better understand how and where *Track-It™* Pressure and Vacuum Data Loggers are used, let's look at some of the basic operating principles of municipal solid waste landfills.

What is a Bioreactor Landfill?

(The following information is an excerpt from: <https://www.epa.gov/landfills/bioreactor-landfills>)

A bioreactor landfill is a municipal solid waste landfill (MSWLF) in which liquids are added to help bacteria break down the waste. The increase in waste degradation and stabilization is accomplished through the addition of liquid and air to enhance microbial processes. This bioreactor concept differs from the traditional “dry tomb” municipal landfill approach.

Types of Bioreactor Landfills

Aerobic - In an aerobic bioreactor landfill, leachate* is removed from the bottom layer, piped to liquids storage tanks, and re-circulated into the landfill in a controlled manner. Air is injected into the waste mass using vertical or horizontal wells to promote aerobic activity and accelerate waste stabilization.

Anaerobic - In an anaerobic bioreactor landfill, moisture is added to the waste mass in the form of re-circulated leachate and other sources to obtain optimal moisture levels. Biodegradation occurs in the absence of oxygen (anaerobically) and produces landfill gas. Landfill gas - primarily methane - can be captured to minimize greenhouse gas emissions and can be used for energy projects.

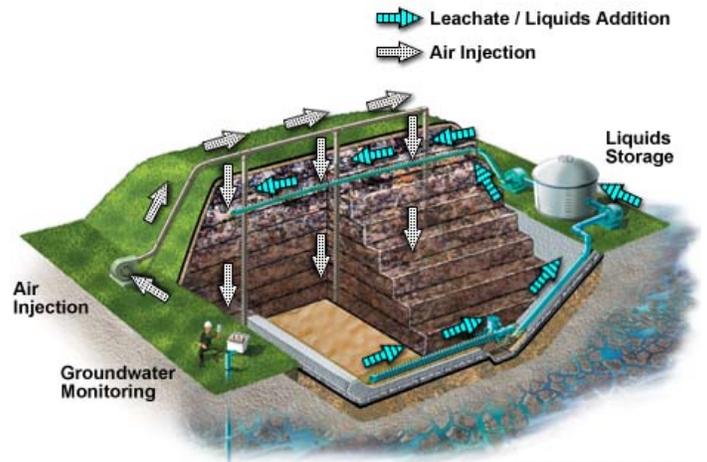
Hybrid (Aerobic-Anaerobic) - The hybrid bioreactor landfill accelerates waste degradation by employing a sequential aerobic-anaerobic treatment to rapidly degrade organics in the upper sections of the landfill and collect gas from lower sections. Operation as a hybrid results in the earlier onset of methanogenesis compared to aerobic landfills.

*** Leachate** - formed when rain water filters through wastes placed in a landfill. When this liquid comes in contact with buried wastes, it leaches, or draws out, chemicals or constituents from those wastes.



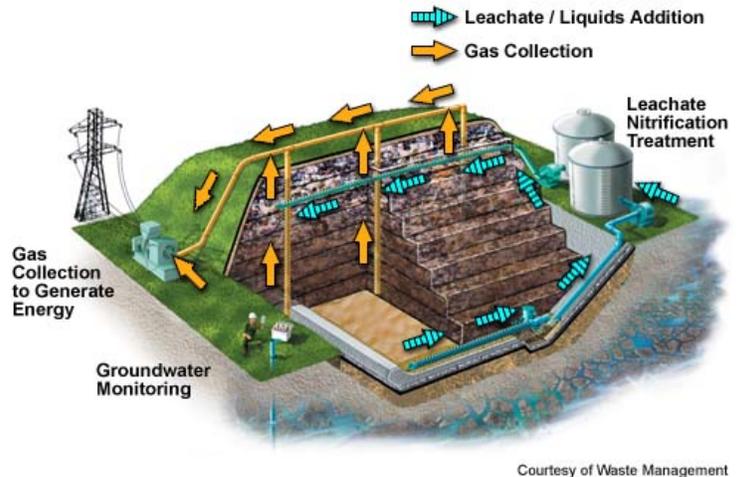
Aerobic Landfill

The image shows a cut-away view of an aerobic bioreactor. Leachate is removed from the bottom layer of the landfill and piped to a liquids storage tank. From the tank, the leachate is piped across the top layer, where it is released to filter down through the landfill to be collected again. A blower forces air into the waste mass through vertical or horizontal wells located in the top layer of the landfill. Groundwater monitoring occurs at wells situated around the perimeter of the landfill.



Anaerobic Landfill

The image shows a cut-away view of an anaerobic bioreactor with elevated levels of ammonium in the leachate. Leachate is removed via pipes from the bottom of the landfill and piped to an on-site biological leachate treatment facility. The facility uses facultative bacteria to nitrify the leachate ammonium to nitrate. The treated leachate and other liquids are then re-injected into the landfill. At the same time, gas generated by the decomposing waste rises through the landfill, and is collected by pipes within the waste and on top of the landfill. The landfill gas that is collected is used to generate energy. Groundwater monitoring occurs at monitoring wells situated around the perimeter of the landfill.



Unique Features to Bioreactors

The bioreactor accelerates the decomposition and stabilization of waste. At a minimum, leachate is injected into the bioreactor to stimulate the natural biodegradation process. Bioreactors often need other liquids such as storm water, wastewater, and wastewater treatment plant sludges to supplement leachate. This enhances the microbiological process by purposeful control of the moisture content, and differs from a landfill that simply recirculates leachate for liquids management. Landfills that simply recirculate leachate may not necessarily operate as optimized bioreactors.

Moisture content is the single most important factor that promotes the accelerated decomposition. The bioreactor technology relies on maintaining optimal moisture content near field capacity - approximately 35 to 65 percent - and adds liquids when it is necessary to maintain that percentage. The moisture content, combined with the biological action of naturally occurring microbes, decomposes the waste. The microbes can be either aerobic or anaerobic. A side effect of the bioreactor is that it produces landfill gas (LFG) like methane in an anaerobic unit at an earlier stage in the landfill's life at an overall much higher rate of generation than traditional landfills.

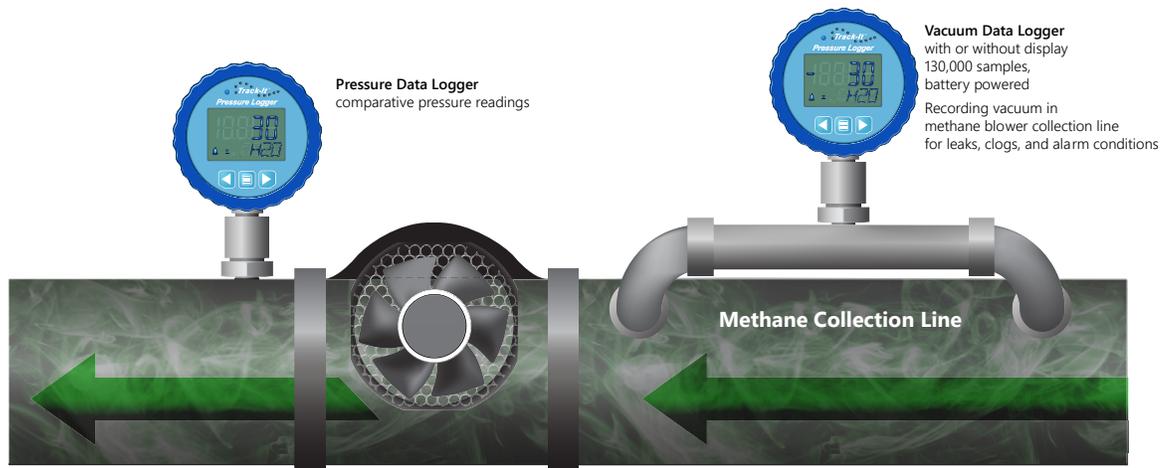


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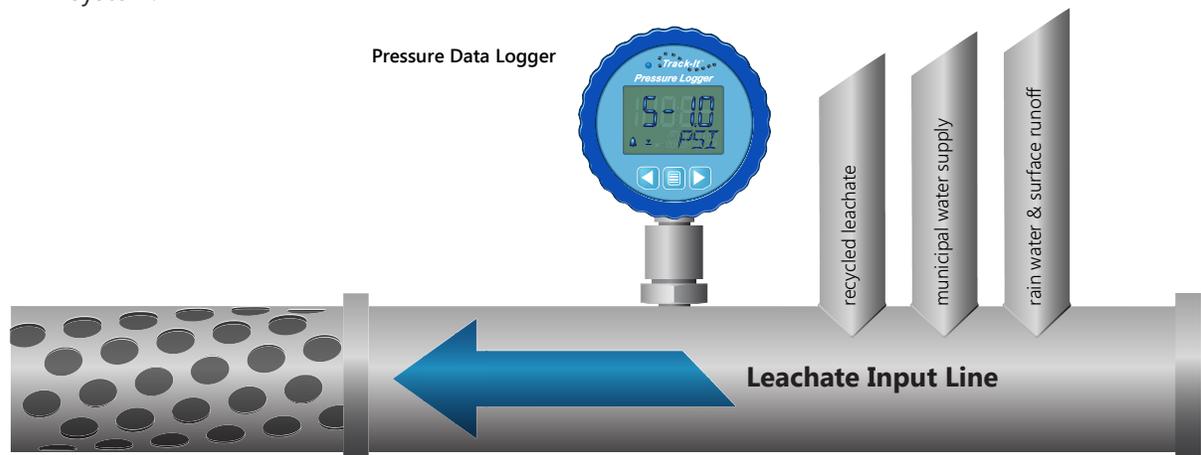
Track-It™ Pressure and Vacuum Data Loggers are commonly installed at various points throughout the landfill systems to diagnose potential problems and maintain regulatory compliance:

- 1. Landfill gas (LFG) collection system:** Landfill gas collection systems typically incorporate a large blower attached to the methane collection pipelines that are distributed throughout the landfill. The blower motor creates and maintains a vacuum on the collection system. *Track-It™* Vacuum loggers are used to continuously record vacuum levels and are often installed in multiple locations throughout the system. Decreasing or increasing vacuum levels can be indicative of leaks or blockages in the system. *Track-It™* Pressure Loggers can be used to monitor pressure on the output side of the blower which can effectively obtain the same information or be used to diagnose problems specific to the blower mechanism itself.



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- 2. Leachate circulation system:** Circulation of Leachate is an integral part of the proper operation of any bioreactor land fill. *Track-It™* Pressure loggers are used to continuously record pump pressures. A loss in pressure can indicate system leaks or problems with the pumping system.



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When it comes to finding the right data logger for Pressure or Vacuum we have you covered.



Track-It™ Pressure/Temp,
Vacuum/Temp
Data Logger with Display



Track-It™ Pressure/Temp,
Vacuum/Temp Data Logger
No Display



Track-It™ Pressure Transmitter
Data Logger with Display

Track-It™ Pressure and Vacuum Data Loggers are battery powered stand-alone devices available with or without a display. They are available in a wide variety of pressure and vacuum ranges. 24Vdc powered versions with linear 4-20mA transmitter output are also available.

For help selecting the proper model contact us at **800-999-3390** to speak with a Technical Sales Engineer or visit our website for more information:

<https://monarchinstrument.com/track-it-data-loggers>

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